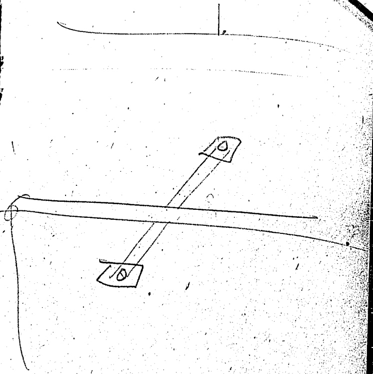
Notebook, N-91-12-30

This notebook covers the period December 1891-January 1892. It was used by Arthur E. Kennelly and an unidentified experimenter as a rough record book in the Galvanometer Room. Most of the book contains notes and calculations regarding conductor determinations for the electrical system at the Columbian Exposition. There are also notes relating to meter tests and dynamometer calibration. Transcriptions of the meter and dynamometer entries can be found in Arthur E. Kennelly Notebook #6. The spine is labeled "129." The book contains 201 numbered pages and has been used in both directions.

Only the material relating to conductor determinations has been filmed.

XE-172

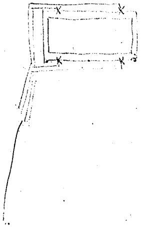
N-91-12-30



Determination of Conductors for the World's Fair

Basis:-

Incandescent Lamps in building	93,450
on outside -	16,000
	109,450
Grounds	22,000
	131,450
Arc Lamps 5000 @ 20	100,000
Total	231,450
HP.	2,365



Drop allowed on services 3 %

Drop allowed on mains 3 %

62007 feet round main cond
10,000 la[illegible] for [illegible] 1½ lb of feed
Main 750 [illegible]

Mines Building
Incandescents 5000
Exterior 1000
Arcs 450 @ 20 9000
15000 lts
1870 γ

Four feeding points situated at
~~1 2 3 + 4~~
~~Feeder terminates at bifurcation of subway~~
~~Subfeeder 1 1150'~~
~~2 750~~
~~3 750~~
~~4 375'~~

1 Feeding point in center distant 1950' carrying 1870 γ

Transportation Building

Incandescent		3000
Arcs	444 @ 20	8880
		11,880
		) 1485

Distance via Mines Building

920 + 1950 = 2870'

Carrying 1485 amp.

Manufactures + Liberal Arts

Incandescents	inside	10,000
Arcs	1700 @ 20	34,000
Incandescents	exterior	2700
		37,700
		4700

#1	3600'
#2	4050
#3	3150'
#4	2250
#5	3050
	16,100

Agriculture

Incandescents		5000
Arcs	648 @ 20	12,960
Exterior		~~10~~700
		19.000
		2,400.

1600 feet via pumping house

Taking Annex + Casino

	19.000
Casino	1 000
Passage	250
Annex	21.00
	22,350.
	2,800

100 100 100 ÷ 1
1000 1000 100 ÷ 1

U. S. Government

Incandescents.	4000

Fisheries

Incandescents	1000
Arcs 175 @ 20	3500
	8500
	1060 γ

4700 feet 1060 γ

$$\frac{4520 \times 750}{40}$$

110 × 750 = 8

$$\begin{array}{r} 750 \\ \hline 825000 \\ 82 \\ \hline 900 \end{array}$$

100 100 100 1

750 1000 7½

0.7

Womens Building

Inc	3500

Horticulture

Inc	1000
Aces 250@20	5000
	9000
	1100

1650 + 2870 = 4520'

1100
400
1500

Art Galleries ~~'46~~
including all Domestic
+ Foreign Countries 20.000 inc.

4790+1600 = 6300!

Results of Interview with
Mr. Stieringer 30th Dec. 91

Incandescent cresting of 10 cp. lamps on buildings fronting Basin. Current to be supplied independently.

2000' on each side
600' " aisle each side

~~550~~

$\frac{5200 \times 2}{3} = \frac{10400}{3} = 3500$

2000 on End building & Colonnades

5500

Total 5500 lamps on cresting & facing

On face of embankment 2480 lamps of 16 cp. each. canal 880

Border of flower beds @ 1' apart 3770 10 cp

7130

Administration Buildn ~~with~~ LE 4000
Cresting of same 2000

13,130

The Theatre may take 6000 lights of 16 cp.

2000 arc lights of 2000 cp each are prospected in the grounds with suitable subways + ducts to be detailed with specifications

Arc lights on posts are distributed at dist: of 50' round main building.

㉟

Basis of new determination

115-volt lamp 3.1 watts per candle

20 candles

$= 63$ watts $= \frac{63}{115} = 0.55$ amp each

10 cp lamps 2 in series $= 0.55$ amp
or 0.275 amp each.

Music Hall 1000 lights 20 cp.
= 275 ampères 3 wire 230 volts

Distance 3100'
25 volts drop.

$$\frac{275 \times 3100}{25} = \begin{array}{r} 341{,}00 \\ \underline{34} \\ 375 \end{array} = \#400$$

Taking on 250 lamps along Colonnade on same feeder gives 12.5 % extra current or 34 more amp. = 309 amp. say 310 and the conductor required = 375 + 47 = 422 say #500.

Alternative plan

Music Hall	1000	20 cp	=	1000
Casino	1000	20 cp		1000
Colonnade	500	10 cp		250
				2250

Casino

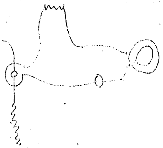
1000 20 cp. lamps

add in ½ Colonnade or 250 10 cp.

= 1125 ÷ 4 = 281 + 28 = 309 amp

Distance 2400 feet

$$\frac{24\,00 \times 309}{24} = \begin{array}{r} 309.00 \\ 31 \\ \hline \# \; 340 \end{array}$$



Best conditions for States
& Foreign Buildings. permanence
for 3000 with such provision
for indicated increase

States Buildings and Midway Plaisance.

26,500 lights specified for
Distribution not known

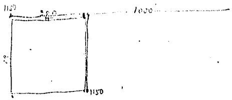
Assume 12,500 lights in States
10,500 midway plaisance 3500 in Illinois
State

Center of distribution behind Annex
of Arts Building

7350 feet

Best method will be alternating.

Administration Building



5100 incandescent lamps of
16 cp 50 watts each ½ amp
1275 amperes and 110 volts.

3250 interior lamps
on one circuit say) = 812 amperes
= # 1000

1824 exterior lamps
on the other circuit = 456 amperes
≐ # 500

$1824 \times 50 = \frac{182400}{2} = 91,200 = 91$ KWTs
Add 10 % for drop = 100 KWTs.

Requirements

For interior lighting via subway)

400 ft: # 1000 tube 812 amp. 3250 lamp.
250 - # 500 - 406 - 1625 -
0 - - 500 - 406 . 1625 .

For exterior lighting via subway

00 ft # 500 tube 456 amp. 1824 lp.
250 - # 500 -
250 - # 500 -

tal underground conductor
900 feet of # 1000
1900 - # 500

$.1 \times 10^{-5} \times 9.0 \times 10^{2} = 10 \times 10^{-3} = 1 \times 10^{-2} = 0.01\,\omega$ 8.12 volt drop
$1.1 \times 11.5 = .00126 \times 800 =$ 10 volts drop.
812 amps. × 120 volts = 100 KWTs
Interior Generators 2 of 100 KWTs, each 120 volts 800)
Exterior generators 2 of 50 KWTs, each 120 volts 456)
Total power 300 KWTs.

Agriculture

3200 16 c.p. lamps inside
800 " " " outside

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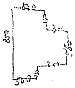
to D 1200 . D to E 950'.
D to F 950'

800 amperes #1000 wire to D

2150 feet 800 amp. 1.1×10^{-5}
2.15×10^{3} 8.0×10^{2}
$17.2 \times 10^{5} \times 1.1 \times 10^{-5} = 18.9$ 19 volts

3300' of #500



130 volts X 800 amps = 10400

Two generators 100 KWTs each 130v. 800 amp.

Exterior to D and E 2150' 800 lamps
200 amps.
1200 feet to E

$250' + 80 + 4^{3}$
0.

Facade is 1300' long. 800 lamps.
8' apart approx:
800 feet = $\frac{8}{13} \times 800 = \frac{64}{13} = 500$ lamps
250 amps carried 400 feet = 100,000
2 volts = 50,0~~00~~ = #500

$1.200 \times 10^{3} \times 1.1 \times 10^{-5} \times 8.00 \times 10^{2}$
$1.2 \times 10^{3} \times 9.9 \times 10^{-3}$
$= 1.2 \times 10 =$
$9.5 \times 10^{2} \times 1.1 \times 10^{-5} \times 4.0 \times 10^{2}$
1.1
3.8 0
3.80
38.75

$4.3 \times 10^{-5} \times 10^{5} = 4.3$

Music Hall & Casino

2750' to J where feeder bifurcates.
300 ft each way? from JK JL

3500 16 cp lamps = 875 amp.
#1000 feeder
D. of P. $0.875 \times 10^3 \times 3.05 \times 10^3 \times 1.1 \times 10^{-5} =$
$2.935 \times 10^1 = 29$ volt.

600 feet of #500 main in each bldg.
500 . . #500 . . corridor.

Basic

$\frac{\cancel{10}^{5}}{\cancel{16}_{8}} \times 0.5 = \frac{0.25}{8} = 0.36 \approx 0.33$

$\frac{7080}{3} = 2360 = 1180 \times 250 = 295$ K

300 KWTS.

$50 \times \frac{5}{8} = \frac{25}{8} = 31$ watts

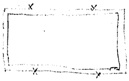
$7000 = 283$

Manufactures

9500 Lamps of 16 cp inside

2375 amperes

1670 × 790 = 2460 × 2 = 4920



594 amperes in each feeder

M	2350'	1050	850	1	650.000
N	3200'	1900	1700	2.	1200.000
P	3150	1850	1700	2	1300.000
D	4000	2700	2500	3	2000.000

$2350 - x = \frac{1}{3}(6000 - x)$

$7050 - 3x = 6000 - x$

$2x = 3050$

$x = 1525$

100 600
100 600
100 600 = 6

Music Building

2800 16 cp. interior 700 amp
[illegible] exterior 50 –

Feeder 1500' to R.
K to C 500
K to T 500
2300' of #500 [illegible] round building

Transportation

23.000 [illegible] lt 16 cp

700 [illegible]

1.86 × 3000 = 5580

Women 3000
Other 26 500
29.500

2950 lts = 740
$\times$ 50
147.500 150 KWTs × 1.1 = 165 KWTs

3000 lts : 370 amp

5000 feet to bank 1
300 ft subfeeder

50 volts drop . $\frac{5000 \times 370}{50}$ = 3400
400 hube

Illinois

2500 lts = 313 amp. @ 440 volts.

Extra margin up to 500 lt:
per front on basis
1000 in all in Manufactures
500 in Trans
500 . Horticulture

500 . H

Government & Fisheries

5000 Govt of 16 cp
500 Fisheries 16 cp
5500 " " "

Double three wire system

625 amp in Govt
63 " " Fisheries
688 " " Both at 200 volts

$\frac{688 \times 4250}{65}$ = 635#423 say #500 cable

20 × 4250 × 688 = 58.5 volts drop

46 – 47	750'	312 amp	#500	3.8 volts
46 – 48	600	312 "	#500	2.8
46 – 49	750	63	#250	2.0
49 – 50	300	32	#250	0.4
49 – 51	300	32	#250	0.4

$\frac{750 \times 312}{5}$ = 450